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solplan review

the independent journal of energy conservation, building science & construction practice

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Passive Solar Heating

From the Editor . . .

As a consumer, it is impossible not to see the changes that are taking place in the retailing sector in Canada as aggressive American and other foreign retail chains set up shop in Canada.

In the short term, consumers may be happy, as the intense competition means price cutting, so there are many bargains to be had. Even the building industry is seeing the winds of change, at least in the major cities, as the building supplies mega-stores set up shop.

The changes may be inevitable, but they do signal a change that merits some concern, as the scale of the operations has potentially devastating impacts on our communities. The size of the market they require means a greater reliance on a few centrally located stores, which rely even more on road transport as you have to travel to the store. This will mean the decay of the neighbourhood shopping centre, and the community it created.

One aspect of the mega stores always highlighted is the customer service that is provided - even though they are self service, staff are trained to be friendly and to assist the customer. You would think the large impersonal operations would have little service, compared to the neighbourhood shop, but it seems that many small neighbourhood shops have forgotten about service.

I wonder how long it will take for a similar service revolution to take place in the construction industry. Over the years I have noted with concern the attitude among so many trades. When times are good, it's a take it or leave it attitude. If you want to do something a little out of the ordinary, a thousand reasons are offered why you can't do it that way. The polite way to say forget it seems to be to ask a ridiculous price surcharge so that the customer will be persuaded not to bother with whatever he was asking for that may have been different.

For a long time the window industry was guilty of this by asking ridiculous premiums for new products such as low-e glass, until the market turned around, and suddenly the premiums are a reasonable, modest increment. To be fair, the same can be said about any sector of the industry.

At the same time, we are being pressured by many sources to incorporate more and more into housing, and not just the consumer's wishes for fixtures, hardware and flooring, but also extras that are being regulated, whether it be sprinklers, security packages, or energy aspects.

The point of it all is that we have to be more open to innovation, new products, and new technologies. Granted, not everything works, and a healthy dose of scepticism is needed, but we should be open to new challenges, and not dismiss those things we may not have seen before. Some of those unusual technologies may save work, and even cost - but we have to give them a chance. Perhaps it means that we have to get away from paying by piece work.

Richard Kadulski,
Editor

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Passive Solar Heating

Do you want an inexpensive, environmentally sound heat source for your home? How about solar energy? Just think: no rate increases, totally renewable, pollution free and requires no fancy technology to tap into! It is here for you today, and can easily provide 50% of heating requirements.

Using the sun for heating is not a new idea. Twenty-five hundred years ago Socrates talked about the importance of designing shelters to take advantage of the sun for heating and cooling. Many traditional types of architecture collect and store the sun's heat for use at night.

For most people the images that come to mind at the mention of 'solar' homes include bizarre-looking experimental buildings complete with ugly 45-gallon drums filled with water and an aging hippy or two. Although 45-gallon drums filled with water are an effective means of storing heat collected from the sun, there are other methods which are not so obtrusive. And solar homes don't have to look like spaceships.

In fact, many houses already are partly heated by solar energy - it's just that they haven't optimized the solar gains. Just think about how hot that south side room can get, even on a cold winter day. If you have to open windows on winter days because it gets uncomfortably hot, you are losing heat because the house design doesn't take advantage of that gain.

In the recent past we've gotten lazy. We've been building without regard to the climate we build in, trying to recreate styles we've become enchanted with during an idyllic vacation to some exotic land, whether or not it makes sense in our climate.

After all, when heat (or occasionally cooling) is called for, we just get a magic black box, plug it in, flick a switch, and presto - instant heat! Amazingly, the same black box does the job whether the house is in Victoria, Yellowknife, Winnipeg, Toronto or Halifax.

With Passive Solar we have to change our thinking, as the house itself becomes part of the solar system.

There are no magic, quick fix rules to give you a simple answer that will make your design a solar house. Every solution is going to be unique, depending on site properties, climate, design needs, and intent. A good solar design will integrate the technical needs to maximize solar gains with the liveability of the house as a home, to meet occupant needs for a pleasant living environment.

Early efforts at solar home design in the 1970's and early 1980's tended to focus on the engineering at the expense of liveability, hence some of the unusual designs that were seen at the time.

Solar starts with conservation.

Reducing heat loss in the winter and heat gain in the summer are the best ways to minimize your heating or cooling costs. Unless the heating needs are reduced to the lowest practical level, it doesn't make sense to attempt to meet most of the demand with solar, because it is generally easier and cheaper to control heat loss than to supply solar gains.

Heat loss cannot be eliminated, but it can be reduced significantly. Building to, or beyond, R-2000 standards can reduce heating requirements by 40 - 50% or more over comparable conventionally built homes. That should be the starting point. This will mean higher levels of insulation, airtight construction techniques, controlled ventilation and an efficient heating system.

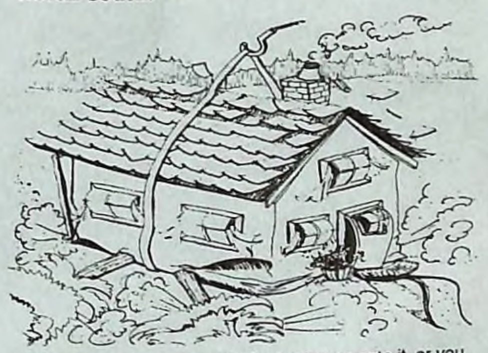
A solar home will collect, store and distribute the heat from the sun. In effect, a passive solar house acts as a big heat collector and storage unit that you can live in. A solar home will not function effectively unless it is designed to contain the collected heat.

Site Planning

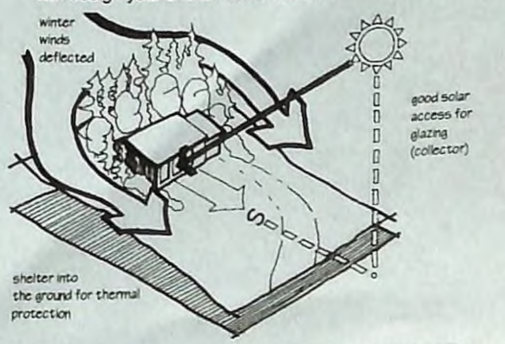
From a solar perspective, the optimum location will be a nice open south facing slope with an open view, sheltered from the north by the slope and trees.

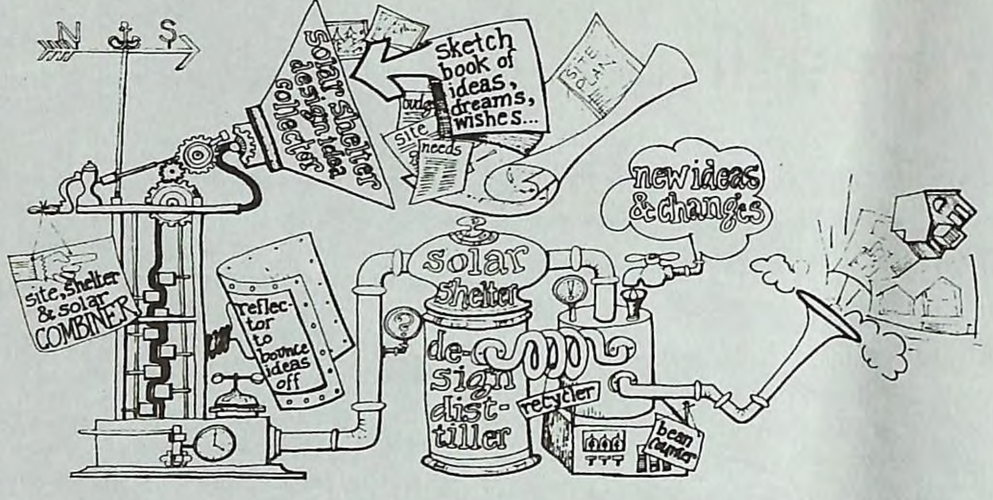
Micro climate conditions also have to be considered. For example, if prevailing storms are from the east or south east, then some sheltering on that side should be considered.

In an urban or suburban area, with small lots, zoning restrictions may severely limit the location of the house. But even in the city, solar energy can be optimized in new developments by proper subdivision layouts that favour solar orientation. For example, in most cases east-west street layouts are better for solar than north-south.



you can ignore your site and plunk a house onto it, or you can design your shelter within the context of your site

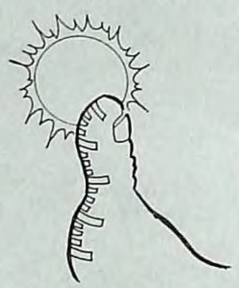




Site planning and landscaping on an individual lot should consider solar aspects. Trees can provide shade for the summer, reducing summer cooling loads. Deciduous trees allow sun in the winter, but some deciduous trees have dense branch canopies that even without leaves do a lot of winter shading too!

The key principle is to take advantage of south side orientation each lot.

Solar rules of thumb



Collecting energy

Place your house where there are no obstructions to the south.

A south facing slope is optimum in many locations. Depending on microclimates, it may be desirable to favour a direction away from true south. Avoid north facing slopes

Optimize the building shape to gain the maximum solar energy in winter with the minimum exposed surface area.

To optimize solar gains, the majority of window areas should face true (solar) south, or within 30° either side of true south. Minimize north-facing windows. Where design requirements call for north windows, especially if that's the direction of the spectacular view, then high performance windows, carefully located, should be considered.

Limit the window area to about 8% of total floor area for conventional building materials and techniques. If window to floor area ratio exceeds 10%, additional thermal mass will be required to store excess heat

Use high performance, energy fficient windows (at least double glazed, low-e, gas filled, insulating spacers). It is worthwhile to consider using different window types for different orientations (e.g. higher performance windows on the north to reduce heat losses). Low-e glass enhances the greenhouse effect by blocking more of the long wave radiation and conductive heat from passing through the glass.

Although windows are responsible for the solar gain, they are also responsible for a large portion of the home's heat loss. This is because glass is a poor insulating material and conducts heat readily. Even good high performance windows do not have as high R-values as insulated walls.

Avoid sloping and overhead glass - it will lead to overheating in the summer. If skylights are desired for light, a small unit will provide a lot, so it's not necessary to use very large lights. If using skylights, use a bronze tinted or reflective outer glazing layer. Always use high performance multi-pane units on skylights.

Design your house to allow as many rooms as possible to receive direct sunlight.

Storing enery

Use energy efficient construction throughout the house - including the foundation - to keep the sun's energy inside.

Consider setting the house into the ground to take advantage of the "thermal flywheel" and sheltering effect of earth berming.

Use thermal storage materials (concrete slab, masonry, ceramic, high density or double drywall or other mass components) in direct sunlight where possible.

Thermal mass moderates temperature extremes by absorbing excess heat during sunny periods and releasing it over night and during overcast periods. The thermal mass also has a fly wheel effect, which delays temperature extremes. The length of the time lag is dependent on the material used for thermal storage, and the quantity.

There is also a limit to the useful quantity of thermal mass. Too much, and it keeps absorbing heat, never having the chance to release the stored heat. For a concrete slab, about 4" of the surface is the active zone. More than 6" in depth it looses its effectiveness.

Distributing energy

Stack living spaces on the south side of the house.

Use open-plan concepts and two-storey spaces (open stairs and double-height spaces).

Use uninterrupted flat or sloping ceiling spaces in order to aid air natural flows.

Locate service areas on the north side of the house to act as a thermal buffer.

Avoid temperature stratification by using mechanical ventilation (ceiling fans, recirculating fans, etc.). But if the house is well built and air tight, the stratification should not be too great.

A lot of the material in this article is taken from the **Maritime Solar Shelter Manual**, a book that is designed to provide information about the design and construction of solar shelters. This is a process-oriented manual - not a technical manual. There are few numbers and few calculations - but lots of practical information that tells you how to take advantage of solar energy.

Even though it's slanted to Atlantic Canada, the principles are applicable anywhere. The bonus is the additional information about design principles and ideas that go into making a nice, good quality home.

The book is available for a give away price of only $15.00 per copy. A definite GOOD BUY.

***Maritime Solar Shelter Manual** by S. Henderson, D. Roscoe & J. Ward.*
For more information:
Solar Nova Scotia
RR #1, McGrath's Cove
West Dover, NS B0J 3L0
Tel: (902) 852-4758

Space & Domestic Water Heating Combo Systems Guidelines

Combo systems, often assembled using a combination of separate components, have been of concern to regulators and suppliers, as there are no standards that deal specifically with such systems.

To help clear up the confusion, BC Gas with BC Building officials and industry has prepared Combo systems guidelines. In a future issue we will highlight the main points.

For a copy of the guidelines or more information:
Kal Minhas, BC Gas
Tel (604) 443-6892
Fax (604) 443-6770

Gas Fired Baseboards

With the increased use of flexible gas piping and individual metering equipment, it is becoming easier to have gas applications that were not feasible a few years ago.

The Canadian Gas Research Institute (CGRI) has developed a new gas baseboard heater that can be used as a retrofit for electric baseboards as well as for new construction, in both multifamily and single family buildings.

The baseboard heater development work was to provide a gas heater which closely resembles existing electric baseboard heaters in appearance and heating capacity.

The compact design uses a concentric vent/air intake system requiring a through-the-wall opening only 1½" in diameter. This makes the appliance easy to install, even in high rise applications, as access to the terminal from the outside is not required.

The gas fired heater is an ideal alternative to electric heaters in multifamily dwellings that have low suite heat losses and no central heating systems. Due to the low natural gas prices, it offers lower operating costs.

Two versions will be available: a power vented version and a natural draft direct vent version. The power vented version of the baseboard heater is designed to accommodate remote thermostat operation allowing the control of several heaters with one thermostat. Both use a sealed combustion design, using only outdoor air for combustion thus eliminating the possibility of release of combustion products to the living space

The sealed combustion direct vent gas fired baseboard heater has been designed as a stand alone appliance, requiring no electrical connections, thus allowing operation even during electrical power outages.

The prototype version of the baseboard heater is enclosed in a casing 9½" high, 5½" deep and 48" wide, designed to operate at a rated input of 5,000 BTU/h (4,000 BTU/h output or 1.2 kW). Thermal efficiencies are in the low 80% range.

Prototype units have been tested in a number of locations over the past 2 years. It is expected to be on the market by the end of this year. Production models are expected to be reconfigured in a shallower cabinet about 2½" deep.

The prototype has been licensed to Hunter Enterprises of Orillia, Ontario.

Information:
Canadian Gas Research Institute
55 Scarsdale Rd.
Don Mills, ON M3B 2R3

Red Deer Renovation Demonstration

Work has started on the demonstration renovation project in Red Deer, Alberta. The project is meant to be a demonstration of a cost effective, energy efficient, environmentally responsible renovation of a single family dwelling that also incorporates healthy construction materials.

A three bedroom house, recently purchased by a community living non profit society, is being made over to accommodate three mentally challenged adults in a residential environment. The work includes replacement of two additions that were in disrepair, an addition, upgrades in the mechanical and plumbing systems, plus basic repairs and clean up.

The project is being overseen by Bowman Husted of the Red Deer Home Builders Association, with the able support of a cast of hundreds. The team is doing a lot of research into healthy products, embodied energy content of materials, etc.

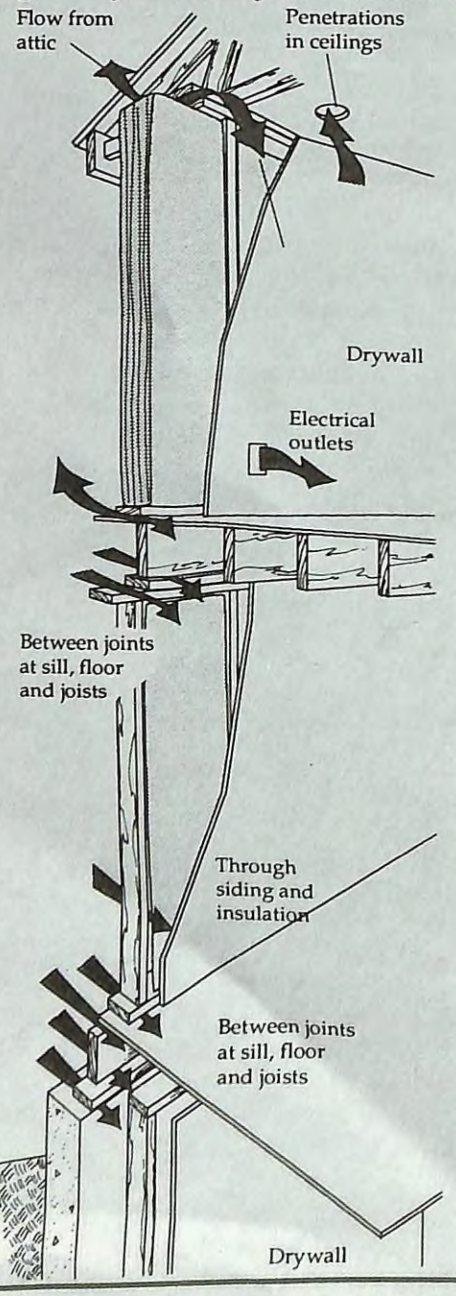
The market cost of the renovation project is $85,000. Contributions from CMHC and NRCan are meant to cover incremental costs of products and systems that may go beyond the normal practice and for documentation, monitoring and publicity. The completed project will be open to the public for display.

For information:
Red Deer Home Builders Association,
Tel. (403) 346-5321

Air Barrier System Details For Houses

Uncontrolled air leakage is a major source of problems in buildings. Excessive air leakage can lead to high energy bills, uncomfortable drafts and cold interior surfaces. More importantly it can contribute to structural damage caused by moisture condensation in the structure. In addition, occupant health can be negatively affected by moisture and mould accumulations associated with air leakage.

Reducing air leakage will protect the durability of a building, will provide for enhanced occupant comfort, energy savings and improved performance of the mechanical ventilation system. Measures for controlling the exfiltration of moist indoor air are included in the Building Code.



Air Flow In Buildings

Air flow in housing is a function of two factors: a pressure difference between the inside and the outside of the building, and a hole through which air can flow. Air flows will be into, and out of, the house. Wind is a major source of pressure difference across the envelope. Positive air pressure is created on the windward side of the building - forcing air in. A negative pressure on the leeward side draws air out of the building.

As air is heated and becomes less dense, it naturally rises. A positive pressure forces air out through the upper parts of the building envelope, drawing cooler air in through the lower portions of the building. This is known as the stack effect. Mechanical exhaust through fans, chimneys and flues also creates a negative pressure, drawing outside air in through openings in the building envelope.

The combined effects of the wind, stack effect and mechanical exhaust equipment will constantly be changing as affected by winds, the seasons and building occupancy.

The Difference Between An Air Barrier And A Vapour Barrier

There are two important parts in the building envelope: the vapour barrier and the air barrier - and there is a difference. It is necessary to understand the importance of air barriers in relation to vapour barriers.

There are two methods of moisture transfer: moisture which is carried in the air that moves through the envelope; and water vapour diffusion. Moisture movement via air leakage through the building envelope accounts for approximately 100 times the amount of moisture that moves by diffusion.

An air barrier resists the flow of air over a normal range of air pressures imposed on a building. An air barrier system may include many components (sheet materials, structural materials, sealants and gaskets) designed and constructed to reduce air flow through the envelope.

A vapour barrier resists the diffusion of water vapour. Open-celled materials allow the smaller molecules of water to diffuse from a region of higher vapour pressure to one of lower pressure. The lower the permeability, the more effective the material at restricting vapour passage. Materials such a glass, foil, polyethylene and many foam materials restrict the diffusion of water vapour. Polyethylene, low permeability paints, and foil, are used as vapour barriers.

In the cold Canadian climate moisture will tend to flow from the inside of a building to the outside during the winter months. Building Code requirements are designed to control the entry of moisture into the insulated cavities. Air barriers must adequately resist the flow of air and be continuous with minimal imperfections and leakage points. They may be located anywhere within the building envelope assembly.

When warm moist air comes in contact with a cold surface, the water vapour in the air will condense - potentially leading to moisture-related problems, thus, continuous air barrier, along with a good air barrier will greatly reduce the potential for moisture entering the cavity. The vapour barrier must always be placed on the warm side of the construction, while the air barrier can be located on the interior or exterior.

Vapour barriers on the warm side should cover as much of the surface area of the envelope as practically possible. (Minor imperfections are permissible.)

When a low permeability material such as polyethylene is used as a combined air/vapour barrier, it must be continuous and located on the warm side of the insulation.

We have to assume that some moisture will enter the construction, so that the moisture entering the cavity should be allowed to 'breathe' to the exterior. Thus, materials used on the exterior should not prevent any moisture that might get into walls and roof assemblies from escaping to the exterior. When an insulated sheathing or 'house wrap' material is used as the air barrier, the material must have a high enough permeance rating to allow moisture to diffuse to the exterior.

Low permeability sheathing, whether it be plywood, particle board or certain foam insulation boards, should not be sealed to form a continuous air barrier unless the inner surface has enough insulation outside, so that it will prevent excessive condensation. Otherwise, it must remain vented to the outside to allow any water vapour to dissipate.

There are many approaches to air barriers and vapour barriers in houses. The most typical include:

- ♦polyethylene serving as both air and vapour barrier;
- ♦exterior house wrap air barrier with interior polyethylene vapour barrier;
- ♦interior drywall serving as the air barrier with polyethylene or low permeable paint serving as the low vapour barrier.

In many cases, a combination of the different approaches may be used. However, the fundamentals must be recognized. The joints between different components of the air barrier are the weakest link, and they have to be sealed together.

> *Attention to detail is key to achieving a successful air barrier.*

When the air barrier is also meant to be a vapour barrier, it must be located on the warm side.

The air barrier and its components should be durable. Where sealants or gaskets are used to bridge materials, there should be a solid clamping, with backing and secure fastening on both sides of the joint.

The use of polyethylene as a combined air/vapour barrier is a common construction practice, although other, often simpler techniques are being used more frequently.

Exterior air barriers have gained greater acceptance in the market. Typically this is the spunbonded sheets such as TYVEK or TYPAR. Some rigid foam insulation boards can also be used as air barriers. They can reduce the work required in sealing penetrations on interior walls and ceilings. However, an interior vapour barrier is still needed.

The use of drywall as the primary air barrier (airtight drywall approach, or ADA) has gained increased market acceptance. Benefits include structural rigidity and accessibility air barrier (located on the interior) for repair over time.

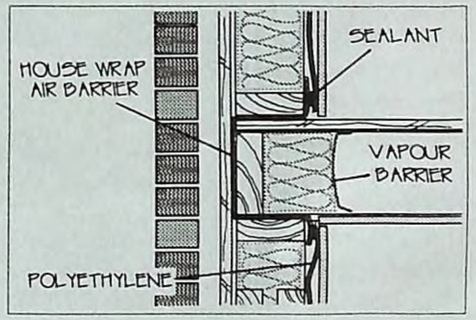
The drywall must be sealed or gasketed to the framing; sealing and gasketing is placed between framing members at the exterior, such as plates, subfloors headers and joists. This will ensure continuity and should accommodate movement in the framing members due to shrinkage or settlement. Foil-backed drywall, a vapour resistant wall primer, or polythene can be used as the vapour barrier.

Attention to detail is key to achieving a successful air barrier.

The foundation/floor header assembly is a major source of air leakage. Air leakage can happen between the foundation and the sill plate; cracks between framing members; and penetrations in the headers. Generic approaches include either 'wrapping' the entire assembly with a sheet material, or sealing/gasketing the various components of the assembly to prevent uncontrolled leakage.

Air Barrier Wrap

Sheet air barriers can be wrapped over the header to provide a continuous air barrier.



Recessed Header Using Polyethylene

The floor joist assembly can be wrapped with a polyethylene air/vapour barrier, providing adequate insulation is installed outside of the polyethylene

ADA

The structural elements of the floor assembly are sealed or gasketed to provide continuity of the air barrier.

Electrical and Plumbing Penetrations

Penetrations into the exterior envelope of the house for electrical outlets and plumbing fixtures are also a potential source of air leakage. These penetrations can be minimized at the design stage with attention to location of outlets and piping. All plumbing fixtures should be located on interior partition walls. Avoid bath-

tubs on exterior walls, but where that can't be avoided, be certain to instal air barriers behind bathtubs and soap dishes, prior to the tub installation.

If the air barrier behind the tub is a flexible sheet, it should be supported by drywall.

Electrical Boxes

Minimize the number of electrical outlets on exterior walls. Where penetrations are inevitable, take advantage of the specialty products designed to make air sealing around electrical and plumbing penetrations easier. Rigid polyethylene surrounds are widely available for use with conventional electrical boxes, but require proper backing and caulking which can be very messy and time consuming. But conventional metal boxes are being rapidly replaced by airtight outlet boxes.

Windows

Thirty-nine percent of house air leakage can happen through the wall/window and wall/door joints if no special attention is placed. Air leakage through windows is a function of both the quality of the window and the installation. The detail that can be used is going to depend on the type of window frame. If polyethylene is the principal air barrier, the windows can be wrapped in a flap of polyethylene prior to installation. Spray in place polyurethane has proven itself very useful for sealing many penetrations through the building envelope.

The leakage due to wall/window and wall/door joints drops to less than 1% of the total house leakage when proper attention is applied.

Air leakage through penetrations in the ceiling include: intersecting walls; attic hatches; recessed lights; plumbing stacks; and flues and chimneys.

Spray-in-place Insulations

Products such as one part urethane, isocyanurate or spray in place polyurethane can be installed into joist cavities to reduce air leakage and provide thermal insulation. While expensive, this approach provides optimum performance.

Heating Ducts

Heating and Cooling ducts should always be located inside. Air leakage from ducts located in the attic can increase the negative pressures inside the building.

Ducts in unheated spaces should be sealed using duct tape or better yet, an acrylic sealer on all joints and junctions of mechanical ducting. (The sealer is commonly used in commercial work). Good practice dictates that all ducts whether inside the house or outside, should be sealed.

***The Details of Air Barrier Systems for Houses** is a well illustrated manual that was prepared by the Ontario New Home Warranty Program with the National Research Council of Canada as a guide to simplify interpretations and identify key criteria for appropriate air and vapour barrier systems.*

The graphics used in this story are taken from this manual.

For information: Ontario New Home Warranty Program Client Services; 5160 Yonge St., NE Tower, 6th Floor, North York, ON M2N 6L9

*The Canadian Home Builders' Association **Builders' Manual** includes a large section on proper air barrier construction techniques. For information: CHBA, 150 Laurier Ave. W., Suite 200, Ottawa, ON K1P 5J4*

*Canadian Home Builders' Association-BC developed a course on **Airtight Drywall Approach Construction.** An illustrated course manual is available. For information: CHBA-BC, Housing Industry Training Centre, 3700 Willingdon Ave., Burnaby, BC V5G 3H2*

Plastic Gas Venting Update

Products banned

As a follow-up to the consumer alert issued on March 23, 1994 about the hazards of some plastic gas venting systems, the Technical Standards Division of Ontario's Ministry of Consumer and Commercial Relations has announced that **Plexvent^{R}, Ultravent^{R}**, and **Selvent^{R}** plastic gas vents may not be sold or installed in Ontario.

The action follows a decision by the Underwriters Laboratories of Canada (ULC) to suspend its recognition of the two plastic vents that it certifies, **Plexvent^{R}, Ultravent^{R}**.

Selvent^{R} is listed by Underwriters Laboratory Inc. (UL) which is currently reviewing their listing of this product. As this product is made of similar material and uses a comparable joining method, the Ministry is also suspending the approval of this product.

In the March consumer alert, consumers with oil, natural gas and propane mid-efficiency furnaces, water heaters and boilers equipped with this type of plastic venting system were advised to have the system checked as soon as possible by the installing contractor or another qualified heating contractor. Although there is no requirement to remove the existing gas venting systems.

Some installations of plastic gas venting systems may present a risk of vent separation at the joint or cracking of the vent tube. If this occurs, flues gases containing carbon monoxide could escape into the household and cause headaches, nausea and in extreme cases, vent, stuffy or humid air and/or strange odours.

The manufacturers of the affected systems are continuing to make product improvements and further information will be provided as it becomes available. In the meantime, the installation of the unapproved plastic vents is illegal in Ontario.

The Cost/Benefits of R-2000

A recent widely syndicated column by Harris Mitchell ("*You Wanted to Know*") made a big issue that savings in heating bills won't justify an upgrade to R-2000. He stressed that the incremental cost of R-2000 wasn't cost effective. This was justified on the basis of that the incremental costs of R-2000 are 5-10% of the construction cost.

A major problem with any incremental cost analysis is what is it that we are comparing? The way we build our houses has changed considerably over the past few years, so that the starting point (the base case) is a moving target. All the evidence we have is that the incremental cost is typically 2-6%. In addition, the standard house today is built substantially differently from the way it was 10 or 15 years ago.

A better way of looking at the incremental costs is looking at the absolute cost differential. Generally, the difference today between most "standard" houses and R-2000 houses is a better mechanical ventilation system, more attention to construction detailing, especially air sealing, and some upgrades to mechanical or building envelope components. In many cases, the cost is fairly constant, not very sensitive to house size. In fact Minto Developments in Ottawa advertises a flat rate of $6,500 as the R-2000 extra for any house it builds. For their standard houses, this works out to about 3-4% extra.

However, the significant question that has to be stressed is not "what is the payback period for the extra cost" but rather "what do you get back for the extra?" After all, there are significant improvements in comfort, improved air quality, less dust and drafts, greater security, a quieter home, and a higher resale value.

The stress in the R-2000 program is the energy conservation features simply because these have been the driving forces behind the program. At the same time these are items that can be measured and quantified. But as the thousands of R-2000 homeowners have discovered, it's the intangible features that can't be easily measured with instruments that come along with these that contribute to a more comfortable home environment.

The actual energy savings will depend on the energy prices, number of occupants, their ages and lifestyle. There are many cases where the energy savings are more than equal to the extra carrying costs for the upgrade.

The R-2000 features should be sold as a quality package, for the features that come with a house meeting the R-2000 technical requirements, not unlike the many other features of a home. We don't hear questions about the payback of the soaking tub, the fourth bathroom, or the ceramic tiles in the entry.

New R-2000 Energy Targets

The new R-2000 Technical Requirements that came into effect April 1, 1994 changed the formula that was used to establish the energy consumption target.

Until now the formula used had several variables, so that it provided flexibility, to ensure that it was sensitive to the climate and building characteristics of a house. In other words, the same house being built in Victoria and Saskatoon would have different energy budgets. At the same time, the larger house would have a different target to meet than the little bungalow.

The new R-2000 energy target will be incorporated into the latest version of HOT-2000 (version 7), which is due to be released later this year. In the meantime, a manual calculation has to be done. The adjustment factor is 0.85 for the target calculated by HOT-2000 version 5.07, or 0.87 for HOT-2000 version 6.02.

The current formula has tended to favour large houses. This has meant that in the past smaller homes have had a tougher time meeting the R-2000 energy targets than did larger homes. Yet smaller houses are, by definition, more energy and resource efficient, than larger houses. A new formula that uses a sliding scale has been developed. It will adjust the target based on the size of the house. This will make it proportionally easier for smaller houses to meet the energy target.

The new formula will be incorporated into HOT-2000 (version 7) that will be available later this year. In the meantime, a temporary manual adjustment factor is being used. For small houses having a heated volume of 375 m^3 (13,243 cu.ft.) the target adjustment factor is 0.98 for the target calculated by HOT-2000 (version 5.07), or 1.0 for HOT-2000 (version 6.02). A 375 m^3 house is about a 1500 sq.ft. slab on grade house, or a 750 sq.ft. bungalow on full basement.

The intention is that by January 1, 1995 HOT-2000 version 7 will be mandatory for R-2000 program compliance.

Budget credits

Another important change in the technical requirements is shift towards total energy use. The formula has been altered so that in the future total energy consumption can be considered (such as cooling and appliances). At this time, a credit will given for energy efficient lighting. If you install fixtures such as compact fluorescent or halogen lights in up to 4 area, a credit will be given. The light fixtures must be hard wired (i.e., it's not good enough just to install a compact fluorescent lamp into a regular light fixture). .

The credits are:

Kitchen:	110 kwh/yr
main hallway:	70 kwh/yr
living room:	65 kwh/yr
family room:	65 kwh/yr
any other room:	17 kwh/yr
utility or other unfinished area:	9 kwh/yr

For further information on the R-2000 Program, contact your local program office, or call: 1-800-387-2000 (Fax 613-943-1590)

Letters to the Editor

Re: "Residential Ventilation" (Solplan Review April-May 1994)

Sir:

You made a statement regarding the amount of fresh air required for metabolic process that is not quite accurate. The number quoted: 10 - 15 cubic feet/minute, probably refers to one of the suggested prescriptive air flow rates given in ASHRAE Standard 62, Ventilation for Acceptable Indoor Air Quality.

The actual amount of oxygen required for the metabolic process in a person with an activity level of 1.2 met units (similar to the activity level of a person sitting at a desk doing normal office work) is approximately 0.006 litres/second which would equal about 0.03 litres/second air assuming there is somewhere's around 20 - 21% oxygen in air. At that activity level, a person has a breathing rate of approximately 0.25 litres/second. Thus, the actual oxygen and air requirements are extremely low.

However, the ventilation requirements you noted in your article deal not with the metabolic process, but with a dilution process required to maintain the concentration of carbon dioxide gas in the occupied space at or below 1000 parts per million (ppm). The concentration of carbon dioxide gas in the atmosphere was chosen as a surrogate for indoor air quality as it was felt that in occupied spaces there would always be a carbon dioxide concentration due to the activity of the people and, from numerous observations and field tests over the years, it appears that the concentration of carbon dioxide in an occupied space should be kept at or below 1000 ppm or the occupants will start complaining about the "indoor air quality". In many areas of the world this is considered a high level. I believe that the World Health Organization recommends that the maximum space concentration of carbon dioxide be maintained at 800 ppm or less.

The value of 15 cfm (7.1 litres/second) of outside air per person was derived using the following formula and is based on the assumption that the people in the space would have an activity level of 1.2 met units which is

Outside Air (V_o) Required for 1 Person:

$$V_o = \frac{N}{C_s - C_o}$$

Where

N = CO_2 production
= 0.30 L/m @ 1.2 met units
C_s = 1000 ppm = 0.001
(CO_2 concentration in occupied space)
C_o = 300 ppm = 0.0003
(CO_2 concentration in outside air)

$$V_o = \frac{0.30}{0.001 - 0.0003}$$

= 428.6 L/m = 7.1 L/s
= 15.1 cfm

The real concern with using fixed numbers such as 15 cubic feet/minute is that this value is only appropriate for a certain specific set of conditions. The amount of ventilation needed in a high activity area such as a school gymnasium could easily be four to five times that required for an office worker if the same level of carbon dioxide concentration was to be maintained.

I enjoy reading Solplan Review as it covers many different areas of the residential construction industry. My engineering background has been mainly in the commercial and institutional building area. However, as any engineer that has been in the consulting engineering field knows, you are often asked to voice some form of opinion as to what is to be done in a single family residence insofar as heating, cooling and ventilation is concerned. I also find your articles on the basic facets of building construction very interesting as they not only apply to housing, but are, in many, cases applicable to the commercial and institutional building sector.

Donald E. Holte, P. Eng.
Edmonton, AB

Sir,

You posed the question "How much ventilation is need?" I would like to add my thoughts on this question as it relates to current practice of designing and installing heat recovery ventilators (HRVs).

For the past seven years I have been inspecting these systems as installed by around nine or ten different ventilation companies. In the last three years I've done over a thousand residential energy audits. Almost 700 of those had energy retrofit work done under my supervision and about 95% of those had a ventilation system of either bath/kitchen fans, a CEV, RCV or HRV installed. I have found that HRVs are the best system for air quality but there is a lot of room for improvement in dealing with the "how much ventilation" question.

You stated we need about 10 to 15 cubic feet per minute (cfm) per person for metabolic purposes, so a family of four would need around 70 cfm.

For air quality we have to look at lifestyle; cooking odours, pets in the home, smokers, hobbies that pollute the air, unwashed clothes and pollutants from the home's building material and furnishings. Air quality requirements vary for person to person. Some people are hypersensitive and the rest of us have varying degrees of sensitivity.

The BC Building Code and CSA F326 stipulate the HRV must be capable of at least .3 air changes per hour (ACH). As you pointed out, our homes are large for the occupant load compared to countries like Sweden. What is also important is the amount of air leakage ("passive ventilation") a home has. F326 assumes a best case scenario of a very tight home with an air change (leakage) rate of .06 ACH. Through hundreds of door fan tests I have found that new and existing homes in the warmer climes of BC are miles away form this level of tightness. New homes might average around .5 ACH, but give them 10

(Continued page. 13)

National Research Council Canada
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The Importance of Dry Lumber

The National Building Code of Canada requires that lumber used for wood-frame construction have a moisture content no greater than 19% when installed. The reasons for this requirement are discussed below.

The drying process

More than half the weight of a tree can be attributed to water. As soon as the tree is cut into logs, these logs begin to lose moisture. If the logs are then allowed to dry, they develop cracks and splits because the outside shrinks more quickly than the inside. To eliminate or minimize this differential between inside and outside, lumber manufacturers saw the logs into smaller pieces (boards) while they are still "wet."

The sawn lumber dries out in two stages. First, the wood cells give up "free" water. Loss of this moisture does not cause the wood to shrink or distort. When the moisture content of the wood has dropped to between 25% and 30% (the fibre-saturation point), the wood begins to lose the moisture in the cell walls. It is during this second stage of drying that shrinkage and warping occur.

The amount of shrinkage and warping that actually takes place in the board depends on the angle of the grain, on how dry it gets and on how it is stored while drying. With proper protection, stacking and restraint to resist warping, most spruce, pine or fir species of wood can be air-dried flat and straight in one summer. Drying can be accomplished in days if done in a drying kiln. The exact number of days required will depend on the species and the size of the individual pieces of lumber. This drying process is called seasoning.

The grade stamp on lumber indicates the moisture content at the time the rough-sawn lumber is planed (called "surfacing"). S-Grn indicates a moisture content greater than 19% (i.e., unseasoned), S-Dry indicates that no more than 5% of the batch exceeds 19% moisture content, and MC 15 means that there is a 15% maximum moisture content. Lumber stamped S-Grn is not prohibited from use, provided that it has been given the opportunity to dry out, either in storage or after framing.

Why the requirement for 19% moisture content?

The requirement in the National Building Code for a maximum 19% moisture content is based on several considerations. They are as follows:

- The drier the lumber when installed, the less shrinkage and warping there will be. The point at which the moisture content for wood stabilizes depends on the region and the season. The moisture content for wood stored under cover during the summer varies from 11% to 12% in most inland areas, while in coastal areas it ranges from 14% to 16%. At these levels, about half to two thirds of the wood's total potential for shrinkage has occurred, and the lumber will remain relatively dimensionally stable in use. If, however, framing that has a high moisture content is enclosed and then subjected to indoor winter heating conditions, the moisture levels can drop to 5% or 6%. This loss of moisture causes shrinkage to occur, resulting in improper seating of floor joists on sill plates and more apparent deflection and vibration as well as squeaking. Shrinkage can also increase the possibility of air leakage through walls, particularly around windows and doors.
- When construction proceeds rapidly, the framing may be enclosed before shrinkage has occurred and before any problems are

construction
Institute for Research in Construction IRC

noticed. The effects of shrinkage are most apparent around windows and doors where the lintels shrink away from the supporting jack studs, creating gaps or cracks. The same problems can occur where metal joist hangers support unseasoned wood joists around floor openings. After the framing is enclosed, corrective action can not be taken.

- The phenomena of nail popping in drywall occurs when the wood shrinks due to rapid drying, forcing the nail head above the surface of the wood. If, however, the wood has been dried to a moisture content of 19%, the likelihood of nail popping is minimized because most of the shrinkage has already taken place. Using wood that has a moisture content below 15% reduces this possibility even further.
- The use of unseasoned lumber to build roof trusses contributes to the potential for truss-uplift problems. If the ceiling is installed before the moisture level of the trusses has had an opportunity to stabilize, the chances of bowing stresses and deformation are increased.
- The drier the lumber, the less prone it is to decay. The development of fungi on wood is largely controlled by moisture content. Most wood-decaying fungi require a moisture content above 25%. Even if there is insufficient moisture, once growth has started the fungi do not die; they merely become dormant. Active growth can start again later. Kiln-drying will kill the fungi, but the wood can get re-infected if it becomes wet again. Thus, the only way to eliminate the possibility of decay is to use wood with a moisture content below 20%.

Keep it dry!

The use of dry lumber makes it easier to build a quality product. However, some precautions must be taken to ensure that the lumber stays dry at the building site:

- Protect the lumber from rain and snow and don't pile it at low points where water may pond.
- Don't store the lumber on or next to bare ground, on concrete floors, near freshly plastered walls, or near other moisture sources.
- Keep S-Dry lumber sealed in its original wrapping until it is ready to be used.
- Store the lumber flat and support it well so that it does not deform. Encourage ventilation by separating layers in piles with sticks.
- Avoid materials or practices that might add moisture to the wood framing before it is enclosed.

This information was prepared by John W. Archer of the National Research Council's Institute for Research in Construction (IRC). The Technical Research Committee of the Canadian Home Builders' Association and Forintek Canada Corp. assisted in its review. For additional information, please contact IRC Client Services by telephone at (613) 993-2607, or by fax at (613) 952-7673.

Canadian Home Builders' Association

Forintek Canada Corp.

Canada

years of wear and tear, shrinkage and settlement not to mention abuse from kids, pets and the occasional B&E and that figure often reaches 2 ACH. New homes also give off more toxic gases and moisture than 10 year old homes and normally need more ventilation than older homes.

When installing an HRV system we don't know how many people will live in the home 10 years from now, who they will be or what their lifestyles will be. This future use may be important to building officials but not to the family who is paying to have a ventilation system installed for the "here and now". To them it is a lot like buying a new car: does it meet their family's needs? Do they care about the next owners concerns? We are currently installing systems to meet code but are these systems flexible enough to adapt to the family's wants?

I have found that like furnace installers, HRV installers think bigger is better. HRVs are often installed so that at low speed the ventilation rate is greater than .3 ACH and high speed is around .5 ACH or more. The result can be drafts, cold homes and high energy bills.

Unfortunately the ducting for most HRV's has to fit around many obstacles and most systems must overcome a static pressure of at least .4" wc. This creates a problem. The higher the duct resistance the smaller the difference between air flows at high and low speeds. Where an HRV is oversized and then dampened down to give just over .3 ACH at high speed, the low speed measured air flow often is only 5 to 10 cfm less than the high speed flow.

If BC houses were built airtight and managed to stay airtight, an HRV with the ability to run from .1 to .3 ACH would probably be ideal for most families considering the size of our homes. But with few exceptions, our homes are not airtight. On cold days air leakage creates enough ventilation that .3 ACH over ventilates most homes. On milder days when there is minimum air leakage, when the garbage is under the sink, the dog, and hockey bag are all off-gassing off .3 ACH might barely be enough.

My sinuses are very sensitive and prior to retrofitting my home I had to sleep under the window cracked open or I would be stuffed up by 1:00 am.

My house is just under 1800 sq. ft. with standard bath fans, ducted kitchen range hood and an occupant load of three. The door fan test shows an estimated leakage area of 54 sq. inches for the home (not as tight as an R-2000 but tighter than most houses I've tested). The HRV I installed is a variable speed model and the flow tests show that it delivers from 68 cfm at high speed to 34 cfm at low speed. There are four humidity gauges in my home in various rooms to track relative humidity levels. At high speed my unit is running at about .3 ACH and this creates too much ventilation if outside it is at or below 0°C. My sinuses tell me when the unit is running too slow or the filter needs cleaning. I find that for comfort and energy efficiency, the speed (flow) of our home's HRV gets adjusted as seasons and weather conditions change.

What is this leading to? I feel I have an ideal ventilation system as I can powervent at source with bath and kitchen fans and also have a ventilation system that meets my family's needs for air quality, comfort and energy efficiency. But the cost of such a system is too high for non-ventilation fanatics. Ideally an HRV system should be able to do it all.

Eneready has come the closest to giving the ability to "do it all" with an HRV using the Eneready ventilation zone system. It uses power controlled grills to temporarily increase ventilation in some rooms when activated by a dehumidistat or timer switch. If the ducting is done properly this system should work well and would certainly be worth the small amount of extra cost. It will never be as effective as a 250 cfm range hood but would probably equal most bath fans. With today's lifestyles most people don't require 250 cfm in the kitchen and may not need a range hood.

The other solution being tried is to switch the HRV into recirculation mode occasionally or to run the HRV intermittently but this approach doesn't seem effective. In my own home I want continuous good air quality. One day I came home, made it three feet in the door and noticed which my house, that never smells musty, didn't have that nice fresh smell that I have come to enjoy and depend upon. The power was off, and I was able to determine that it had been out for about three hours. I thought this was a good example of what an intermittent controlled HRV would be like.

We need four things in relation to HRV's. First, we need the ventilation rate to have a greater degree of adjustability to suit the homeowner's ever changing wants and needs. We have to design to meet code but the system should be able to adapt to the owner's needs. For this to happen the manufacturers of HRV's will have to use better (DC?) motors and a speed control that allows a much greater range. Secondly, the system should be able to meet extra ventilation requirements for a short term in areas such as bathrooms and kitchens. The third is that installers not oversize HRVs and/or undersize ducts. Lastly, and this is the hard one, owners need to understand their HRV systems.

Gary Backlund
Ladysmith, B.C.

Technical Research Committee News

Canadian Home Builders' Association

National Energy Code

CHBA made a presentation on behalf of its members during the first review period for the proposed energy code which ended in May. Among concerns raised were issues related to enforcement, and how that will be handled. Many building officials themselves are not ready or comfortable with the possible extension of their responsibilities.

Chimney flue Failures

Many problems have been noted recently, some leading to fatalities. The Saskatchewan Research Council will be undertaking a detailed study to determine the nature of the problems and why flue failures have been happening.

Basement Performance Guidelines

Performance guidelines for basement systems taking into account all factors that influence the operation of a basement, such as drainage, backfills, moisture action, insulation, concrete and other structural materials, etc. are being developed by an industry collaborative group including CHBA, Ontario New Home Warranty Program, CMHC, Society of plastics Industries, and the Institute for Research in Construction (NRC).

Exterior Basement Drainage layers

Codes and good building practice require that backfill against foundation walls be free draining. There are a number of products on the market that are designed to act as exterior drainage layers, keeping water from getting at the foundation walls. But did you know there are no performance standards to define what such products have to do? CHBA, IRAP, and 10 manufacturers got together with the Canadian Construction Materials Centre (CCMC) to develop such performance standards. These will include allowable compression loads, durability, water permeance, etc. The results are expected within six months.

Electric Ceiling radiant systems

Ceiling heating panels manufactured by Thermaflex Scotland have created major concerns in a number of areas, as they have been the cause of numerous fires. This has led the Building Standards Branch in BC to require a maximum R40 insulation over any ceiling radiant panel, and not to allow the use of cellulose insulation in such situations.

The Scottish company claims that a major problem may be with the nature of the gypsum board that is used in Canada. In Europe, plaster is the standard material used, and has different constituents.

Moisture content in lumber

The building code requires that framing lumber moisture content not exceed 19%. In some areas, especially Atlantic Canada, this is a problem as the lumber industry has not had adequate facilities for drying lumber, so that all that is available often is "pond dried" or green lumber with much higher moisture contents.

Generally, if proper attention is taken during framing, and adequate time is given, even green lumber will begin drying out during construction, and moisture related problems will be minimized. But is some areas, and at some times of the year, climatic conditions may not be suitable to promote drying during framing stages.

In the Atlantic region the warranty program has had many claims due to high moisture levels, so they have decided to enforce the 19% moisture content requirement. Warranty inspectors will be showing up on site with moisture meters.

A similar situation has arisen in the Ottawa area, where the moisture content will be enforced by warranty inspectors. If a builder wants to use wet lumber, he can provided he posts a $2,000 bond with the Warranty program.

CHBA Position Paper on the Scope of Building Regulations

We've reported on the many changes that are constantly being introduced into the Building Code and other building regulations. Increasingly, the codes are beginning to introduce many societal goals into the mandatory regulations. Security issues, sprinklers, and environmental issues are just some of the high profile areas of concerns that are finding their way into codes. This is raising concerns about just how far these changes are going to go and is that the best way to introduce societal changes into the industry.

There are significant impacts on affordability and access to decent housing, as well as legislation of lifestyle options.

The CHBA position paper poses three basic questions that should be asked before any change is accepted:

1. *Is there a health and safety problem?*
2. *Does the proposed requirement alleviate the problem?*
3. *Is the proposed requirement expensive?*

It also points out that if it is deemed necessary to legislate some element affecting housing, the regulations should be separate from the building code, but they should be written in a way that uses the National Building Code as a model, for separate adoption by individual jurisdictions that may feel it appropriate to adopt such regulations.

Copies of the paper are available from your local Home Builders' Association, or from the TRC.

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. To contact the TRC:
Canadian Home Builders' Association
Suite 200, 150 Laurier Ave. West,
Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214

Code and Construction Guide for Housing

An Illustrated Guide to the Building Code.

The Canadian Home Builders' Association of BC, along with the Building Inspectors' Association of BC and New Home Warranty Program, have just published the Code and Construction Guide for Housing - a B.C. version of the successful Guide first published in Ontario.

This completely revised version details all BC Building Code references for residential wood frame construction and includes the latest revisions to the Code.

The book is divided into two sections. The first part all relevant BC Building Code references for residential wood frame construction in construction sequence. The second part explains the Code in plain language with graphic illustrations and details, showing how to and better ways to build than just code minimums.

The 16 Chapters are organized in actual construction sequence, from Start Up, Foundations through Walls, Roofs, to Exterior Finishes and Garages. No longer do you have to flip back and forth in the Code to find all the references for one segment of the building process. The illustrations make it easier to understand too.

CHBA BC hopes the Guide will help bring more uniformity to building code interpretations around the Province. The Guide will likely be used by college students as a Text.

Useful in other jurisdictions too!

Code and Construction Guide for Housing: *$ 59.95 ($49.00 for members)*
Information:
CHBA BC
Housing Industry Training Centre
3700 Willingdon Ave
Burnaby, B.C. V5G 3H2
Tel: (604) 432-7112
Fac: (604) 432-1038

Defect Prevention

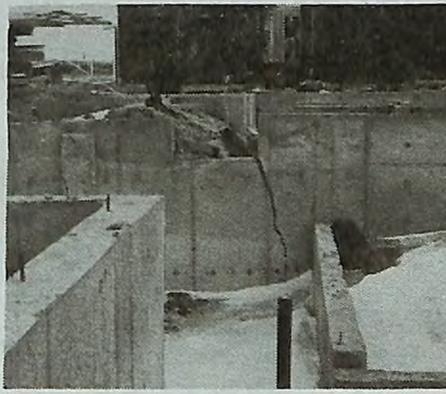
While many houses are well built with few problems, large payouts are still made by warranty programs. These are a concern to consumers, builders, inspectors and the warranty programs.

The Ontario New Home Warranty Program and CMHC looked at the cause of most frequently occurring defects. They hope to develop technical information programs, identify future research and development needs, and confirm targeted inspection areas.

The study noted that small builders in small Ontario communities contribute to the most costly defects to the Warranty Program.

Most Frequent Defects

1. The most common of all claim items are drywall problems, generally located throughout the house and caused by poor workmanship, improper framing and the lack of care taken in installation. Visible seams, poor finishes, cracks, and damage are all common complaints.
2. Foundation walls, 85% of all foundation wall problems are associated with cracks and water leaks and occurred in poured concrete walls, only 11% occurring in concrete block.
3. Improper installation of door and frame assemblies, so they are inoperable.
4. Missing and incomplete trim, along with poor finish quality.
5. Windows/Doors/Skylight/Frame: unsealed or uncaulked, improperly installed, and damaged frames for both exterior windows and doors, including garage doors.



Most Costly Defects

1. Foundation walls.
2. Slabs, which are also a component of foundations. Approximately 89% of slab claims are related to frost heave and settlement.
3. Ceramic tile, largely related to poor workmanship that results in cracked, broken, uneven alignment, and improperly installed tiles.
4. Failure of leaching beds, which meant failure, improper grading, too small field beds, and leaching.
5. Improper installation of door and frame assemblies, causing them to be inoperable.

Most Frequent Building Code Warranty Defects

1. Missing air/vapour barriers, weather stripping, and insulation.
2. Unsealed or uncaulked air barriers, and vapour barriers.
3. Problems with settlement of poured concrete garage slabs
4. Missing and improperly installed "sump pumps"
5. Missing, improperly installed and too small attic access hatch.

Most Costly Building Code Warranty Type Defects

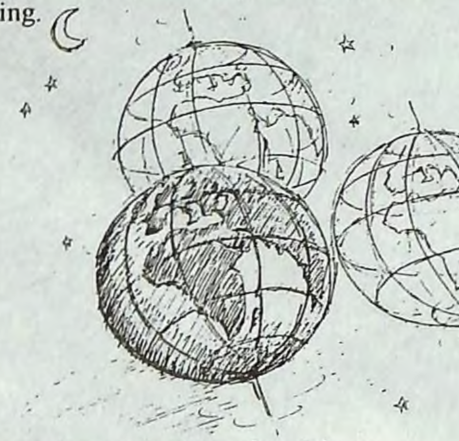
1. Problems with settlement of poured concrete garage slabs
2. Improperly sized septic tanks
3. Improperly installed and not secured ceramic tiles
4. Concrete block, and poured concrete foundation "walls"

How Big is our Ecological Footprint?

We depend on nature to provide a steady supply of the basic requirements for life. Energy is needed for heat and mobility, wood for housing and paper products, and we need food and clean water for living. Plants convert sunlight, carbon dioxide, nutrients and water into plant matter. All the food chains which support animal life - including our own - are based on this plant matter. Nature also absorbs our waste products, and provides life-support services such as climate stability and protection from ultra-violet radiation.

We often forget or ignore how our life is interwoven with nature. As most of us spend our lives in cities and consume goods from all over the world, we tend to view nature as a collection of commodities or a place for recreation, rather than the very source of our existence.

If we want to have to good living conditions forever, we must ensure that nature's productivity isn't used more quickly than it can be renewed, and that waste isn't discharged more quickly than nature can absorb it. This is what sustainable development is all about. We know from the increasing loss of forests, soil erosion and contamination, fishery depletion, loss of species and the accumulation of green house gases that we are in danger of compromising our future well-being.



Wanted: two phantom planets!

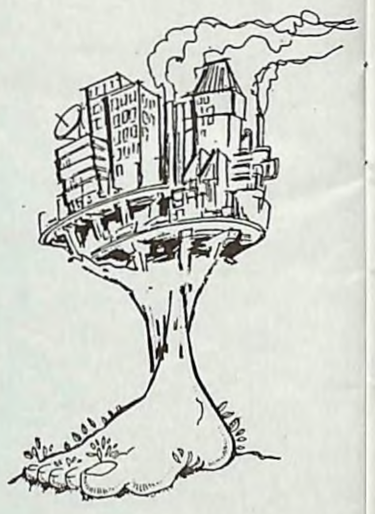
To find out whether nature provides enough "resources" to secure good living conditions for everyone in a community, the Task Force on Planning Healthy and Sustainable Communities at the University of British Columbia has developed an ecological accounting tool that uses land area as its measurement unit. Various human activities are translated into the areas of productive land required to provide those items. From that, the area of land required by a given group of people (household, city or country) to provide its resources and assimilate its waste products can be calculated. This land area is known as the Carrying Capacity or, more simply, the group's *ecological footprint* - the land that would be required to support our current lifestyle forever.

The ecological footprint of an average Canadian, i.e. the amount of land required to support each individual's present consumption is over 4.8 hectares (11.8 acres) - roughly comparable to three city blocks. While 4.8 hectares per person may not seem like much in a large country like Canada, it's more serious when we consider the Global perspective.

The table shows how big the ecological footprint for each of our activities is, and how it adds up.

"Energy" as used in the table means how much land would be necessary for the long term provision of a biological substitute for fossil fuels (coal, oil and natural gas). "Built Environment" means land that's no longer available for nature's production because it's been paved over or used for buildings. "Resources in Services" are the fuel needed to heat a hospital, or the paper and electricity used to produce a bank statement.

The ecologically productive land available to each person on Earth has decreased over the last century. At the moment there is, on average, 1.6 hectares (about one city block), or 1/3 of the area which each Canadian is currently using. If everyone on Earth lived like us, we'd need at least 3 Earths to provide all the material and energy essentials we currently use.



And we know that the population of the world is growing, as are third world demands for resources.

The Lower Fraser Valley, the area east of Vancouver, which contains 1.7 million people or 4.25 people per hectare is far smaller than that needed to supply the resources for its population. If the average Canadian needs 4.8 hectares then the Lower Fraser Valley needs an area 20 times larger than what's actually available for food, forestry products and energy. (And this is one of the most productive areas in the Country).

Holland with a population of 15 million people, (4.40 people per hectare) and a population that consumes less than the average Canadian, still requires more than 15 times the available land for food, forest products and energy.

What is not produced locally, must be brought from somewhere else, in other words, human settlements don't affect just the area where they're built.

Higher densities in cities can lead to lower land use requirements, not only because of a reduction in the built environment, but also because of lifestyles which are less energy-intensive. A San Francisco area study found that when

residential density was doubled, private transportation was reduced by 20 to 30%. Also, residential heating requirements can be reduced significantly if housing is grouped rather than free-standing.

What's this mean?

Our Challenge is to find a way to balance human consumption and nature's limited productivity to ensure that our communities are sustainable locally, regionally and globally. We don't have a choice about whether to do this, but we can choose how we do it. There's still time for us to make our communities more sustainable, and at the same time improve our quality of life.

- The development industry has a significant role to play in developing sustainable communities.
- This means working to integrate environmental, economic and social policies so that economic success, ecological integrity and social health become compatible.
- We must develop an infrastructure that leaves options open, rather than one which dictates lifestyles for our own and future generations, and makes it easier to reduce resource consumption.
- We have to plan attractive higher population-density areas such as town centres and urban villages instead of accommodating further sprawl.
- We have to reallocate urban space to encourage a decreased use of cars; we should encourage the planting of trees and greenspaces; and promote various kinds of affordable high-density housing such as secondary suites and cooperatives
- We have to introduce construction guidelines which minimize the consumption of resources; and develop comprehensive waste reduction systems which include municipal resource reuse and reduction schemes.
- We should rely on locally available resources rather than imported ones, by supporting local community-based industry and encourage ecologically sound businesses.
- It means we have to start charging (and paying) the true costs for transportation, pollution and resource use.

If we as an industry don't start doing this, then we will be forced to, and regulated into action! This is the direction that has been taken by the Advanced houses program, and is now finding its way into the R-2000 program.

by Mathis Wackernagel with the Task Force on Planning Healthy and Sustainable Communities, The University of British Columbia, Vancouver, B.C.

	Energy	Built Environment	Agricultural Land	Forest	TOTAL
Food	0.4		0.9		1.3
Housing	0.5	0.1		0.4	1
Transport	1	0.1			1.1
Consumer Goods	0.6		0.2	0.2	1
Resources in services	0.4				0.4
TOTAL	2.9	0.2	1.1	0.6	4.8

The ecological footprint of the average Canadian, in hectares per capita.

The Great Canadian Reno-Demo Project

In the last few issues we have reported on the renovation project your editor has undertaken. While most of you are sitting around the deck, lifting a pint or two, your editor is trying to get fit and shed a few pounds. Lowering the basement floor means a lot of hand digging - and there's still lots to be done!

We will be using floor radiant heating. Doing energy calculations I discovered that the amount of insulation under the heated slab made little difference (using R12 as the base). The results showed so little change when insulation levels were increased, that I made enquiries, only to find that there is not a lot of information on the performance of heated floor slabs.

As a result, with the participation of BC Hydro, we hope to instrument a number of points in the floor slab and the ground adjacent to the slab, so that we can measure the actual performance of the system.

In the next issue we will have a more detailed status of the project.

Renewables '94
20th Annual Conference of the Solar Energy Society of Canada
Renewable energy can be put to work today! Technical and practical sessions on various aspects of renewable energy use. Oct. 30-Nov 2, 1994, Ottawa, Ont.
Information:
SESCI, Suite 250 2415 Holly Lane
Ottawa, ON K1V 7P2
Phone/Fax (613) 523-0974

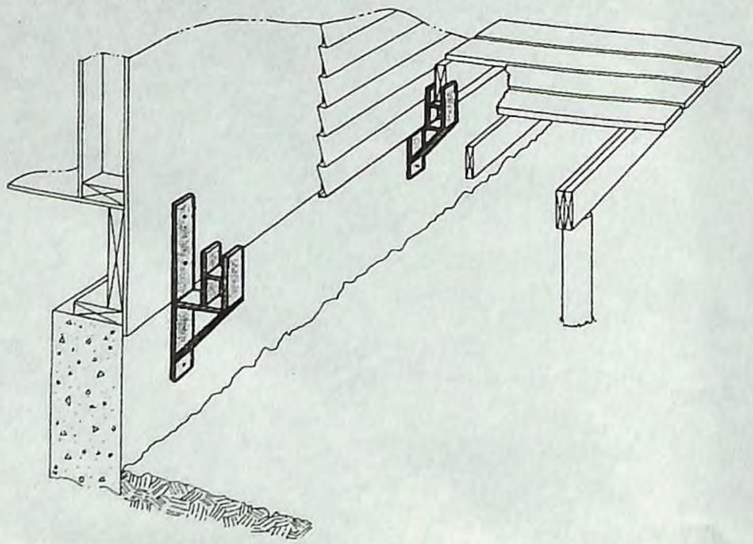
Support Bracket for Decks and Landings at Foundation Walls

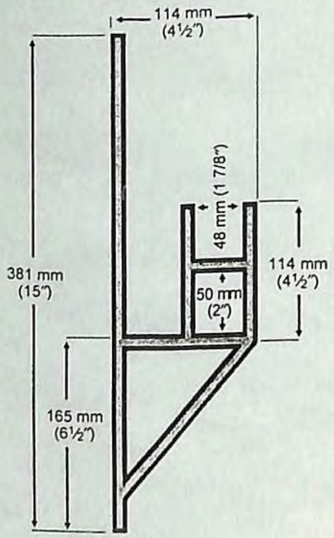
Exterior landings and decks are either anchored to the existing foundation, mechanically fastened to the framing members of the structure, or installed on piers next to the foundation wall. These methods sometimes have adverse effects on the building envelope or weeping tile.

Clifford Desveaux of M & D Contracting Glace Bay, Cape Breton, NS has designed a support bracket that allows independent movement of the deck, thus decreasing the possibility of damage to the deck from frost heave or lateral movement. As well, this system leaves a 1" space between the cladding and deck, allowing water and snow to escape from around the cladding. It is fabricated from metal flat stock, 51 mm wide x 6 mm thick (2" x ¼").

The support bracket is anchored to the header joist of the building, is covered by cladding and will be invisible from the exterior. (Ensure that an effective air barrier is in place between the sheathing and the exterior siding).

The deck header is placed into the free-floating pocket of the bracket, while the perimeter of the deck will be supported on concrete piers and footings.





This idea was a winner of the Job-Site Innovator Awards Program

CMHC's Job-Site Innovator Awards Program recognizes builders, renovators and tradespeople who have developed simple techniques to make construction and renovation easier, faster, safer or more cost-effective. Winning innovations receive a $250 local award and qualify for a $1000 regional award and a $2000 national award.

For more information or an application form, contact your local CMHC branch office.

Or Terry Marshall, Project Manager, at CMHC's National Office. Tel: (613) 748-2046
Fax: (613) 748-2402

Next Issue

Stories we working on include:

Energy Efficient Lighting:
what is it, what's new, how to shop for residential lighting products.

Insulation Values of building assemblies:
it's not the label on the package that matters, but how the assembly is put together

The Great Canadian Reno-Demo:
Systems that were chosen, and why

Plus much more. Be sure to not to miss any issues. If you're not a subscriber, do it TODAY!

Back Issues

A selection of key articles in recent issues includes:

Solplan Review No. 54
Resource efficiency issues: Global Warming; resource efficient building; Steel Framing; HOT-2000: comparing simulated data to actual measurements; Indoor-Outdoor relative humidity conversion

Solplan Review No. 53
Water Conservation: rating toilets, composting toilets; Builder's Environmental checklist; Proposed Code changes

Solplan Review No. 52
Attic Ventilation; Fibre insulation: does it perform as advertised? Sump Pump performance; Environmental by Design: sources of environmentally aware material choices

Solplan Review No. 51
Keeping Cool: Cooling urban environments by environmental design; Solar shading screens; HRV system efficiency; Brampton Advanced House performance

A full Index to the first 49 issues was printed in issue No. 50. A limited number of back issues are still available, for a special price of $4.50 each.

Bundle Special: we have a limited number of packages of back issues (minimum 22 copies, random selection of issues) for only $50.00

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